Separation by Plasma Implantation of Oxygen (SPI-MOX) Operational Phase Space

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Abstract—Separation by plasma implantation of oxygen (SPI-MOX) has been suggested as an economic alternative for separation by implantation of oxygen (SIMOX) to form the silicon-on-insulator (SOI) structure. The chief advantage of SPI-MOX is the high throughput and low-cost implanter. The operation regime of implantation for SPI-MOX, which uses dc plasma immersion ion implantation (PIII) for the oxygen implantation, has been studied in the phase space of implantation time and chamber pressure during implantation. The phase space is developed for a definite implantation voltage and dose which are dependent on the dimensions of the SOI structure to be fabricated. The effects of dose, implantation voltage, and fractional ionization on the phase space have been discussed. SPI-MOX can achieve high throughputs for thin-SOI structure fabrications using high fractional ionization plasmas. The phase space developed for SPI-MOX implantation can also be used for other high-dose dc implantations with PIII which require a peaked implant profile below the surface.

Index Terms—PIII, plasma processing, silicon on insulator, SIMOX, SOI, SPI-MOX.

I. INTRODUCTION

Silicon-on-insulator (SOI) has an important role to play in the low-power low-voltage electronics of the future [1], [2]. Low-cost and high-quality SOI wafers would, therefore, be desirable for the IC industry. However, all of the present methods of fabricating SOI wafers are expensive. The high cost of SIMOX, one of the popular SOI fabrication techniques for the IC industry, is mainly due to: 1) the expensive implanters that are used for the oxygen implantation, and 2) the long time required to implant the high dose of oxygen necessary to form the buried oxide. Attempts are made to fabricate SOI wafers with thinner buried oxide to lower the implantation time [3]. The implantation current of conventional implanters is increased to reduce the implantation time and increase the throughput [4], [5].

Among the alternative methods of forming SOI wafers, separation by plasma implantation of oxygen (SPI-MOX) is promising [6]–[9]. The SPI-MOX process uses plasma immersion ion implantation (PIII) [10] to implant the high dose of oxygen required to form the buried oxide. The implanted wafer is then annealed at 1300°C for 6 h to form a continuous buried oxide and the SOI structure. The chief advantage of the SPI-MOX process over the conventional SIMOX process is the lower cost involved in the implantation of oxygen. This is because of economical implanters and high throughput in the case of SPI-MOX. The implantation equipment, unlike the implanters in the conventional SIMOX process, does not require mass selectors, acceleration columns, and complex wafer-handling and scanning systems—all of which increase installation and maintenance cost. The implantation rate of oxygen for SPI-MOX is much higher than that for SIMOX. If the implantation ion-current density in the SPI-MOX process is maintained constant, the per-wafer implantation time is independent of the wafer size. In the conventional SIMOX process, on the other hand, the implantation time increases as the square of the wafer diameter (Fig. 1). This is significant because the wafer size for IC fabrications is progressively increasing.

In order to fully exploit the advantages of SPI-MOX, an understanding of the implantation process and the allowed operational regions is important. A discussion of the implantation parameters is followed by the implantation requirements for

Fig. 1. Theoretical calculation of the time taken to implant an ion dose of $1 \times 10^{18}$ cm$^{-2}$ in the conventional SIMOX process (with 75-mA implantation ion-current density) and the SPI-MOX process (with 1-mA cm$^{-2}$ implantation ion-current density). The former uses conventional implantation, and the latter uses plasma immersion ion implantation (PIII). The implantation time is an increasing quadratic function of the wafer diameter in SIMOX, but is a constant for the SPI-MOX process.
SPIMOX. The implantation constraints are identified. For a particular overlayer and buried oxide thickness of SOI, the operational phase space of implantation time and chamber pressure is developed. The effects of the implantation voltage, dose, and fractional ionization of the plasma on the operational phase space are discussed based on this model. The phase space developed here for SPIMOX implantation can also be applied for other processes which require a subsurface peaked implant profile, e.g., implantation of H or He for the smart-cut process using PIII [9].

The experimental details of the SPIMOX process carried out and the results obtained are described below, followed by the details of the implantation phase space developed.

II. THE IMPLANTATION PROCESS

A schematic diagram of the PIII system used for SPIMOX to implant the oxygen ions into single crystal silicon wafer is shown in Fig. 2. The wafer to be implanted is immersed in a plasma of oxygen or water. A negative dc voltage is applied to the target. The negatively charged electrons are repelled away and the positively charged ions are accelerated toward the negatively biased wafer target. Most of the applied voltage drops across the sheath. The positive ions are accelerated by the voltage drop across the sheath before implanting into the target. In order to maintain the crystallinity of the top silicon surface, the temperature of the wafer during implantation is held at 550–600°C. This temperature of the target wafer prevents it from becoming amorphous during the implantation. A higher temperature would result in SiO2 precipitate formation across the width of the implant profile, resulting in a poor-quality top silicon overlayer [11].

It is important to implant the right dose of oxygen to obtain a continuous buried oxide by annealing at 1300°C following the implantation [6], [7], [12]. The probability of precipitation of the oxides is higher wherever the concentration of the implanted oxygen is higher. Therefore, a single subsurface peaked implant profile helps in the formation of a single continuous buried oxide. Multiple peaks in the implanted oxygen profile could result in competitive nucleation at the different peak regions [6], [7]. This could lead to multiple oxide layer formation. Multiple peaks could form due to the presence of ions with different charge-to-mass ratio in the plasma. In the oxygen plasma, for example, one may find O+ as well as O2+. The presence of these ion species in comparable concentrations in the plasma during implantation leads to double oxide layer formation in SPIMOX. For the conventional SOI structure formation, this is undesirable. The plasma source must be tuned to make one of the species dominant to avoid multiple layer formation.

III. EXPERIMENT AND RESULTS

A single-crystal 100-mm-diameter p-type (100) wafer was used to fabricate SOI using the SPIMOX process. The wafer was introduced in a plasma of oxygen. The pressure in the implantation chamber was kept at 50 mtorr. The plasma in the chamber was generated by an ECR source operating at 2.45 GHz. The ion species composition of the plasma from the plasma source was determined using a mass spectrometer. The predominant ion-species was found to be O2+, with concentration ten times that of O+. The wafer was biased at negative 60 kV. This implantation voltage corresponded to an implantation depth of 67.8 nm for O2+ ions according to simulations in TRIM 92B. The wafer was implanted for 6 min. As there was no external temperature control during the implantation, the ion current was kept low to prevent overheating. The ion current was controlled by varying the ion density in the plasma by adjusting the control parameters of the plasma source. Pyrometer measurements showed that the wafer temperature during implantation was above 550°C.

After implantation, the wafer was capped with oxide and nitride layers. This capping was to protect the top silicon surface from pitting during annealing. The wafer was then annealed at 1330°C for 3 h in an atmosphere of nitrogen.

Fig. 3 shows an XTEM micrograph of the SOI structure fabricated by the SPIMOX process. The buried oxide is 25 nm, which corresponds to a dose of 1.1×10^{17} cm^{-2} of oxygen. The silicon overlayer, which is single crystalline, has a thickness of 50 nm.

IV. SPIMOX IMPLANTATION PARAMETERS

The implantation parameters in SPIMOX are the applied voltage (V0), ion dose (D0), the time of implantation (t_{imp}).
and the pressure \((p_0)\) of the chamber during implantation.

The first two parameters, \(V_0\) and \(D_0\), are determined by the composition of the ion present in the plasma, the desired silicon overlayer thickness \((T_{Si})\), and buried oxide thickness \((T_{BOX})\) of the final SOI structure to be produced.

Almost all of the applied voltage \(V_0\) drops across the sheath formed around the target during implantation. The ion accelerated across the sheath crashes into the target with an energy of \(qV_0\). If the ion consists of more than one atomic species \((O_2^+, H_2O^+, \text{etc.})\), the atomic bonds break up due to the impact of the implantation into the target. The energy of the bonds is a few volts, and is negligible in comparison to \(V_0\), which is a few kilovolts. Due to conservation of momentum and energy, the effective implantation voltage of oxygen \((V_{imp})\) for an ion mass of \(M_{ion}\) is

\[
V_{imp} = V_0
\]

where \(\xi\) is the fraction \(16/M_{ion}\), while \(M_{ion}\) is given in amu.

For \(O_2^+\) ions, the value of \(\xi\) is 0.5. For \(H_2O^+\) and \(O^+\) ions, \(\xi\) is 0.89 and 1, respectively.

If there are \(c\) oxygen atoms present in the ion, the oxygen dose in the wafer \(D_{imp}\) is

\[
D_{imp} = c \cdot D_0.
\]

For implantation with \(O_2^+\) ions, \(c\) has a value 2, whereas for \(O^+\) and \(H_2O^+\) ions, the value of \(c\) is 1.

For a given ion species, the implantation range \(R_p\) is a monotonic function of the applied bias voltage \(V_0\). This relation can be obtained from simulation programs such as TRIM

\[
R_p = R_p(V_{imp}) = R_p(V_0 \cdot \xi).
\]

The nucleation of the largest oxide precipitates is most likely to take place at \(R_p\) below the surface. To first order, this can be considered to be the center of the buried oxide formed [10]. The values of \(T_{Si}\), \(T_{BOX}\), and \(R_p\) are related by

\[
R_p = T_{Si} + 0.5 \frac{T_{BOX}}{2.2}.
\]

In the above equation, the factor of 2.2 is to account for the increase in volume when silicon oxide is formed. Using (3) and (4), the value of the parameter \(V_0\) to be used for SPIMOX can be estimated for the desired SOI dimensions.

The second parameter, \(D_0\), is fixed by the buried oxide thickness according to the following equation.

\[
D_0 = \frac{4.4 \times 10^{22} \cdot T_{BOX}}{c} \text{ ions cm}^{-2}
\]

where \(4.4 \times 10^{22} \text{ cm}^{-3}\) is the number density of silicon dioxide, \(T_{BOX}\), the buried oxide thickness, is given in centimeters, and \(c\) is the number of oxygen atoms per ion being implanted.

V. THE PHASE SPACE OF STUDY FOR SPIMOX IMPLANTATION

The implantation process is studied in the phase space spanned by the parameters \(t_{imp}\)—the time taken to implant, \(p\)—the chamber pressure during implantation. The time taken to implant the required ion dose \(D_0\) at the required implantation voltage depends on the ion-current density \(J_0\)

\[
J_0 = \frac{q \cdot D_0}{t_{imp}}.
\]

Here, \(q\) is the electronic charge. \(J_0\) is controlled during implantation by controlling the plasma condition in the chamber, i.e., plasma ion density, electron temperature, dominant ion species type, and abundance.

Lower \(t_{imp}\) and hence higher throughput is one of the chief reasons the SPIMOX process is attractive. It would be useful to know the range of feasible implantation time for a given final silicon overlayer and buried oxide thickness in the SPIMOX process.

The chamber pressure \(p\) is an important controllable parameter for the SPIMOX implantation that determines the mean-free path of the ions, the gas breakdown voltage, and the upper limit of the number of ions that can be made available.

For these reasons, the SPIMOX implantation process is viewed in the phase space of \(t_{imp}\) and \(p\). The operational and forbidden regions in this phase space based on the implantation constraints can then be identified.

VI. SPIMOX IMPLANTATION CONSTRAINTS

Four implantation constraints are identified for the SPIMOX implantation. These constraints are plotted in the \(t_{imp}-p\) phase space as shown in Fig. 4. The phase space corresponds to the implantor used at Berkeley for \(V_0\) of 100 kV and \(D_0\) of \(2.2 \times 10^{17} \text{ cm}^{-2}\) \((T_{Si} = 88 \text{ nm} \text{ and } T_{BOX} = 100 \text{ nm})\). The oxygen plasma considered is dominated by the \(O_2^+\) ion species. The shaded region in the figure shows the allowed regions of operation for SPIMOX implantation. The location in the phase space.
space depends on the fractional ionization of the plasma. Each of the constraints is developed and discussed in detail below.

A. Constraint I: Collisionless Sheath

A spread in the implantation energy of the ion would cause a spread of the implant profile. This results in nucleation of the oxide precipitates over a wide band up to the surface. This could lead to discontinuities in the buried oxide with some of the oxide formed at the surface during high-temperature annealing (Fig. 5). Pulsed signals with significant rise and fall times lead to multiple-energy implants. Multiple-energy implants are also possible if there is charge exchange or collisions of ions with neutrals in the implantation sheath. Monoenergetic implantation can be obtained by using dc bias and ensuring collisionless sheath during implantation.

The implantation with a collisionless sheath and large negative dc bias can be modeled as a collisionless Child law sheath [13]. The ion-current voltage relation for such a sheath is given by

\[ J_0 = \frac{4}{9} \varepsilon_0 \left( \frac{2q}{M_{\text{ion}}} \right)^{1/2} V_0^{3/2} \cdot \frac{1}{s^2} \]  

(7)

where \( s \), the sheath thickness, is given by [13]

\[ s = \frac{2}{3} \varepsilon_0 \left( \frac{q n_{\text{ion}}}{M_{\text{ion}}} \right)^{1/2} \cdot \left( \frac{2V_0^3}{T_e} \right)^{1/4} \]  

(8)

where \( \varepsilon_0 \) is the permittivity of vacuum, \( n_{\text{ion}} \) is the positive ion density in the plasma, and \( T_e \) is the electron temperature in the plasma in volts.

A collisionless sheath, which is desirable for SPIMOX implantation, means that the mean-free path (\( \lambda \)) in the chamber should be larger than the sheath width that is formed during the implantation (9)

\[ \lambda > s. \]  

(9)

The mean-free path \( \lambda \) for a given pressure \( p \) is given by

\[ \lambda = \frac{kT}{p\sigma}. \]  

(10)

Here, \( k \) is the Boltzmann constant, \( T \) is the absolute temperature inside the chamber, and \( \sigma \) is the effective cross section of ion–neutral interaction (collision and charge exchange) in the sheath.

Using (7)–(10), the collisionless implant constraint in the \( t_{\text{imp}} \) and \( p \) phase space is given by (11)

\[ p < \frac{kT \cdot 1}{\sigma} \cdot \left( \frac{4\varepsilon_0\left( 2qD_0 \right)^{1/2}}{M_{\text{ion}}} \right)^{1/2} \cdot \left( \frac{qD_0}{M_{\text{ion}}} \right)^{1/4} \cdot \frac{1}{t_{\text{imp}}^{1/2}}. \]  

(11)

The curve corresponding to this constraint on the phase space is plotted as curve I in Fig. 4. The allowed region of operation for this constraint lies below this curve. Choosing a conservative value for the ion–neutral interaction cross section of \( 10^{-14} \text{ cm}^2 \) [14], an \( \text{O}_2^+ \) dominant plasma, and implantation time of 10 min, the pressure of operation due to this condition must be below \( 7 \times 10^{-5} \text{ torr} \).

B. Constraint II: Finite Ion Supply

The ion current in SPIMOX is limited by the ion density at the plasma sheath edge

\[ J_{\text{ion}} = n_{\text{i}} \cdot q \cdot u_B \]  

(12)

where \( u_B \), the Bohm velocity, is given by

\[ u_B = \sqrt{\frac{qT_e}{M_{\text{ion}}}}. \]  

(13)

Here, \( q \) is the electronic charge of \( 1.6 \times 10^{-19} \text{ C} \), \( T_e \) is the electron temperature in the plasma in volts, and \( M_{\text{ion}} \) is the mass of the positive ion that is implanted.

The ion density is a function of the fractional ionization and the number of particles available for ionization. The
former is a function of the type of plasma source and its ionization efficiency, and the latter depends on the pressure in the chamber. Thus

$$n_{\text{ion}} = \alpha \frac{P}{kT}.$$  \hspace{1cm} (14)

Here, $\alpha$ is the ionization efficiency, which is one when all of the particles in the chamber are ionized and zero when all of the particles in the implantation chamber are neutrals. Therefore

$$J_0 = \alpha \frac{P}{kT} q \cdot u_B.$$  \hspace{1cm} (15)

The maximum ion current obtained will be for the case $\alpha = 1$. In the $t_{\text{Imp}}$ and $p$ phase space

$$p \geq \frac{kT D_0}{\alpha \cdot u_B} \cdot \frac{1}{t_{\text{Imp}}}.$$  \hspace{1cm} (16)

with the equality being valid for complete ionization when $\alpha = 1$, which is an idealized situation. In reality, $\alpha$ for a highly ionized plasma is in the range of 0.001–0.1.

This constraint is shown as curve II in Fig. 4. The region of operation allowed by this constraint is the area above the curve. For an electron temperature $T_e = 2$ V, the pressure of operation during implantation must be above $4 \times 10^{-8}$ torr for a $t_{\text{Imp}} = 10$ min.

C. Constraint III: Gas Breakdown Voltage

The implantation voltage has to be lower than the gas dielectric breakdown voltage in the implantation chamber at the operating pressure. The relationship between the breakdown voltage and the operating pressure is obtained from the Paschen curve for the gas. This curve is to be evaluated for each implantation system being used. The constraint due to gas breakdown can be expressed as

$$p < p(V_0)$$  \hspace{1cm} (17)

where $p(V_0)$ is determined from the Paschen curve evaluated for the particular system of operation. The breakdown measurements taken in the Berkeley PIII system is shown in Fig. 6. It is seen that for pressures below $10^{-3}$ torr, the breakdown voltage is well above 70 kV. Curve III in Fig. 4 represents this constraint on the $p$-$t_{\text{Imp}}$ phase space. This curve is an estimate of the breakdown pressure for 100 kV implantation.

D. Constraint IV: Heat Dissipation Capability

In order to maintain the target wafer temperature steady at 600°C during implantation, the heat dissipation capability of the target wafer at this temperature must be at least equal to the input power. In steady state, this is expressed by the following equation:

$$V_0 \cdot J_0 \leq H$$  \hspace{1cm} (18)

where $H$ is the maximum heat dissipation capacity per unit area of the target wafer at the temperature of implantation. Here, $H$ encompasses all forms of heat dissipation, viz. conduction, convection, and radiation cooling from the target. On $t_{\text{Imp}}$ and $p$ phase space

$$t_{\text{Imp}} \geq \frac{V_0 \cdot J_0}{H}.$$  \hspace{1cm} (19)

This is represented by curve IV in Fig. 4. The allowed region of operation according to this constraint lies to the right of curve IV.

For commercial systems, the maximum rate of heat dissipation is typically 17 W cm$^{-2}$ by gas-conduction cooling (room temperature has been assumed to be 30°C and the target wafer temperature 600°C during implantation) [15]. The radiation heat loss is 1 W cm$^{-2}$ at 600°C [16]. Hence, for a typical value of $H = 18$ W cm$^{-2}$, the minimum time taken to implant an ion dose of $2.2 \times 10^{17}$ cm$^{-2}$ at 100 kV is 3.2 min.

VII. DISCUSSION OF MODEL

The dimensions of the SOI structure formed depend on $V_0$ and $D_0$. Larger $T_{Si}$ and $T_{SiO2}$ require higher values for $V_0$ and $D_0$. This would, in turn, affect the operational region in the implantation phase space. The effects on the operational phase space and the minimum time required for implantation due to $V_0$ and $D_0$ are discussed below.

The actual operation point on the phase space depends on the fractional ionization of the plasma. The range of fractional ionization required to operate optimally in the implantation phase space is also discussed.

A. Effect of Implantation Voltage ($V_0$)

The implantation voltage determines how deep the oxide layer is going to be formed from the surface as seen from (3). The effect of increasing the implantation voltage on the phase space is shown in Fig. 7. The phase space for three values of $V_0$ (70, 100, and 140 kV), corresponding to a top silicon layer thickness of 56, 88, and 130 nm, respectively, for an O$_2^+$ dominant plasma implantation, is studied. The ion dose considered is $2.2 \times 10^{17}$ cm$^{-2}$.

The ion availability constraint is not affected by $V_0$. The heat dissipation limit constraint severely affects the minimum
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Fig. 7. Phase space for oxygen implant for bias voltages of 70, 100, and 140 kV. These biases for an $O_2$ dominant plasma correspond to a silicon overlayer thickness of 56, 88, and 130 nm, respectively, corresponding to an ion dose of $2.2 \times 10^{17} \text{ cm}^{-2}$. The operational phase space is reduced primarily due to the heat dissipation. The actual location of the constraint due to the gas breakdown voltage at different implantation voltages has to determined by experiment for a particular PIII system.

time for implantation. The minimum time for implantation due to this constraint increases proportional to $V_0^3$ (19). For an increase of $V_0$ from 70 to 140 kV, the minimum time for implantation due to this constraint increases from 2.26 to 4.52 min. These values are for an implantation dose of $2.25 \times 10^{17} \text{ cm}^{-2}$ and a heat dissipation capacity of 18 W cm$^{-2}$. The allowed operational pressure during implantation would also be reduced to satisfy the breakdown constraint as the implantation voltage is increased. Depending on the design of the system, this constraint could reduce the allowed operational phase space.

B. Effect of Implantation Dose ($D_0$)

The implantation dose directly affects the buried oxide thickness in the SOI structure (5). The effect of $D_0$ on the constraints defining the implantation phase space is observed in Fig. 8. The phase spaces for three doses ($2.25 \times 10^{17}$, $5 \times 10^{17}$, and $1 \times 10^{18} \text{ cm}^{-2}$), corresponding to a buried oxide thickness of 100, 200, and 400 nm, respectively, are shown. These curves correspond to an implantation voltage of 100 kV in an $O_2$ dominant plasma.

In this case, the breakdown limit is not affected by $D_0$. The heat dissipation capacity limit is severely affected by the dose. As seen from (19), the minimum time for implant is proportional to $D_0^3$. For a dose increase from $2.25 \times 10^{17}$ to $1 \times 10^{18} \text{ cm}^{-2}$ (corresponding to 100 and 400 nm of buried oxide thickness, respectively), the implantation time increases from 3.26 to 13.2 min. As before, the maximum heat dissipation capacity of the wafer holder is taken to be 18 W cm$^{-2}$.

C. Effect of Plasma Ionization Efficiency ($\alpha$)

The phase space developed for SPIMOX implantation shows that it is possible to obtain short implantation times for the high dose of oxygen required for SOI fabrication. The actual operation point in the phase space depends on the fractional ionization in the plasma. The locii of the operation points in the phase space corresponding to fractional ionization of 0.1, 0.2, and 1% are show in Fig. 9. The phase space is plotted corresponding to $T_{\text{ox}} = 100$ nm and $T_{\text{Si}} = 88$ nm ($V_0 = 100$ kV and $D_0 = 2.25 \times 10^{17} \text{ cm}^{-2}$ for an $O_2$ dominant plasma).

For the lower fractional ionization of 0.1%, the minimum implantation time limited by the collisionless sheath requirement is 12 min. In the phase space being considered with a wafer holder heat dissipation capacity of 18 W cm$^{-2}$, the minimum implantation time for an ionization fraction of 0.2% is 3.26 min, and it is dictated by the heat dissipation capacity of the wafer holder. This remains true for any ionization fraction above 0.2% up to the ideal 100%. The collisionless sheath constraint boundary shown here corresponds to the sheath width being equal to the ion mean-free path. For monoenergetic implantation, it is preferable to operate as far below this curve as is practical. From this consideration, it is better to have as high a fractional ionization as is permissible by the plasma source and the ion confinement technology to obtain a subsurface-peaked implant profile. High ionization sources [17] like electron cyclotron resonance (ECR), transformer couple plasma (TCP), and helical sources are available which can give high fractional
ionization up to 1–10% and are well suited for the SPIMOX implantation.

VIII. CONCLUSION

The SPIMOX process which uses PIII for high-dose oxygen implantation has a definite cost advantage over the conventional SIMOX. The constraints in the SPIMOX implantation have been mapped onto the phase space of pressure of the chamber during implantation and the time required for implantation. This phase space can be determined for a particular specification of SOI dimensions—the silicon overlayer thickness and the buried oxide thickness.

The limiting constraint for SPIMOX implantation is the heat dissipation capacity of the target-wafer holder at the temperature of implantation. With the increase in implantation voltage and dose, this limitation becomes more pronounced. SPIMOX implantation at higher voltages would also increase the implantation time because of the necessity to operate at lower pressures to avoid breakdown.

High-ionization plasma sources like ECR and TCP are necessary for SPIMOX application. The chamber design should also try to minimize ion loss. This will help in providing a higher ion current at lower pressures.

The analysis has assumed that the required ion current will be provided by the current source supporting the PIII system. The actual current drawn from the current source will be higher, depending on the secondary electron emission during implantation at a particular voltage. This factor has to be taken into consideration when selecting a current source to drive the PIII system for SPIMOX.

The phase-space analysis developed is a convenient way to determine whether the SPIMOX implantation could be carried out for a given plasma source and PIII system. From the discussions of the operational phase space, it is clear that SPIMOX is most suited for thin-SOI fabrication. The lower voltage and lower dose allow a much higher throughput rate compared to the conventional process. The move toward thin SOI for IC fabrication in the industry makes the SPIMOX process particularly promising.

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REFERENCES


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